

CLAIMS

- 1 1. A server for use in connection with a network including at least one client and a communication
2 link interconnecting the client and server, the server comprising:
 - 3 A. an image rendering module configured to render, from three-dimensional scene data
4 representing a scene, a two-dimensional image; and
 - 5 B. an interface configured to transmit the two-dimensional image over the communication link
6 to the client.
- 1 2. A server as defined in claim 1 further comprising a user interaction control module configured to
2 control interactions with said at least one client in connection with rendering of the image from the
3 scene data.
- 1 3. A server as defined in claim 2 in which the image rendering module is configured to render
2 images from scene data representing a plurality of scenes, the user interaction control module being
3 configured to select scenes for which images are to be rendered.
- 1 4. A server as defined in claim 3 in which the user interaction control module is configured to select
2 scenes for which images are to be rendered in response to requests therefor.
- 1 5. A server as defined in claim 4 in which the requests are received from the at least one client.

6. A server as defined in claim 4 in which a request can contain scene customization information requesting at least one customization to the scene, the user interaction control module being configured to enable the image rendering module to render an image of the scene as customized in relation to the customization information.

7. A server as defined in claim 6 in which the at least one customization to the scene can be represented in images rendered for selected ones of clients, the user interaction control module being configured to enable the image rendering module to control ones of the clients for whom images are rendered depicting the customization.

8. A server as defined in claim 2 in which the user interaction control module includes:

- A. an operator graph generation module configured to generate, when the server is to render said image, an operator comprising at least one operator, said at least one operator being configured to enable said image rendering module to perform at least one operation in connection with rendering of the image; and
- B. an event manager configured to control execution of said at least one operator in response to the occurrence of at least one event.

9. A server as defined in claim 8 in which the operator graph generation module comprises:

- A. a user manager module configured to select operators of selected operator types for use in the operator graph, and
- B. a connection manager module configured to connect the selected operators into the operator graph.

10. A server as defined in claim 9 in which scenes for which images are to be rendered are selected in response to requests therefor, and in which a request can include scene customization information requesting at least one customization to the scene, the user manager module being configured to select operators for use in the operator graph in response to the image requested by and scene customization information contained in a request.

11. A server as defined in claim 8 in which the image rendering module comprises:

- A. a scene database configured to store scene data representing at least a portion of the scene for which an image is to be rendered
- B. a customization module configured to customize the scene data contained in the scene database;
- C. a rendering engine module configured to utilize the scene data in the scene database in connection with rendering at least a portion of an image; and
- D. a job manager module configured to control the customization module and the rendering module in connection with execution of said at least one operator in the operator graph.

12. A server as defined in claim 11 in which, in response to execution of said at least one operator, the job manager module is configured to establish at least one job, the at least one job being executable by at least one of said customization module or the rendering engine module.

13. A server as defined in claim 12 in which, in response to execution of said at least one operator, the job manager module is configured to establish a plurality of jobs in a job dependency graph, each

job being executable by at least one of said customization module or the rendering engine module,
and select ones of the jobs in the graph for execution.

14. A server as defined in claim 13 in which the job manager module is configured to select ones of
the jobs for execution in relation to respective job cost values associated with the respective jobs.

15. A server as defined in claim 14 in which the job manager module is configured to assign
respective job cost values in relation to an estimate of server resources used during execution of the
associated jobs.

16. A computer program product for use in connection with a computer to form a server for use in
a network, the network including at least one client and a communication link interconnecting the
client and server, the computer program product comprising a computer-readable medium having
encoded thereon:

- A. an image rendering module configured to enable the computer to render, from three-
dimensional scene data representing a scene, a two-dimensional image; and
- B. an interface module configured to enable the computer to transmit the two-dimensional
image over the communication link to the client.

17. A computer program product as defined in claim 16 further comprising a user interaction control
module configured to enable the computer to control interactions with said at least one client in
connection with rendering of the image from the scene data.

1 18. A computer program product as defined in claim 17 in which the image rendering module is
2 configured to enable the computer to render images from scene data representing a plurality of
3 scenes, the user interaction control module being configured to enable the computer to select scenes
4 for which images are to be rendered.

1 19. A computer program product as defined in claim 18 in which the user interaction control module
2 is configured to enable the computer to select scenes for which images are to be rendered in response
3 to requests therefor.

1 20. A computer program product as defined in claim 19 in which the requests are received from the
2 at least one client.

1 21. A computer program product as defined in claim 19 in which a request can contain scene
2 customization information requesting at least one customization to the scene, the user interaction
3 control module being configured to enable the computer to enable the image rendering module to
4 render an image of the scene as customized in relation to the customization information.

1 22. A computer program product as defined in claim 21 in which the at least one customization to
2 the scene can be represented in images rendered for selected ones of clients, the user interaction
3 control module being configured to enable the computer to enable the image rendering module to
4 control ones of the clients for whom images are rendered depicting the customization.

1 23. A computer program product as defined in claim 17 in which the user interaction control module
2 includes:

- 3 A. an operator graph generation module configured to enable the computer to generate, when
- 4 the server is to render said image, an operator comprising at least one operator, said at least
- 5 one operator being configured to enable the computer to enable said image rendering module
- 6 to perform at least one operation in connection with rendering of the image; and
- 7 B. an event manager configured to enable the computer to control execution of said at least one
- 8 operator in response to the occurrence of at least one event.

1 24. A computer program product as defined in claim 23 in which the operator graph generation
2 module comprises:

- 3 A. a user manager module configured to enable the computer to select operators of selected
- 4 operator types for use in the operator graph, and
- 5 B. a connection manager module configured to enable the computer to connect the selected
- 6 operators into the operator graph.

1 25. A computer program product as defined in claim 24 in which scenes for which images are to be
2 rendered are selected in response to requests therefor, and in which a request can include scene
3 customization information requesting at least one customization to the scene, the user manager
4 module being configured to enable the computer to select operators for use in the operator graph in
5 response to the image requested by and scene customization information contained in a request.

1 26. A computer program product as defined in claim 23 in which the image rendering module
2 comprises:

- 3 A. a scene database configured to enable the computer to store scene data representing at least
- 4 a portion of the scene for which an image is to be rendered

- 5 B. a customization module configured to enable the computer to customize the scene data
6 contained in the scene database;
- 7 C. a rendering engine module configured to enable the computer to utilize the scene data in the
8 scene database in connection with rendering at least a portion of an image; and
- 9 D. a job manager module configured to enable the computer to control the customization
10 module and the rendering module in connection with execution of said at least one operator
11 in the operator graph.

1 27. A computer program product as defined in claim 26 in which, in response to execution of said
2 at least one operator, the job manager module is configured to enable the computer to establish at
3 least one job, the at least one job being executable by at least one of said customization module or
4 the rendering engine module.

1 28. A computer program product as defined in claim 27 in which, in response to execution of said
2 at least one operator, the job manager module is configured to enable the computer to establish a
3 plurality of jobs in a job dependency graph, each job being executable by at least one of said
4 customization module or the rendering engine module, and select ones of the jobs in the graph for
5 execution.

1 29. A computer program product as defined in claim 28 in which the job manager module is
2 configured to enable the computer to select ones of the jobs for execution in relation to respective
3 job cost values associated with the respective jobs.

- 1 30. A computer program product as defined in claim 29 in which the job manager module is
- 2 configured to enable the computer to assign respective job cost values in relation to an estimate of
- 3 server resources used during execution of the associated jobs.